

ADMISSIBILITY FRAMEWORKS AND SCIENTIFIC EVIDENCE: CONTROVERSIES IN RELATION TO SHAKEN BABY SYNDROME / ABUSIVE HEAD TRAUMA

Marika L. Henneberg*

University of Portsmouth, UK

ABSTRACT

Criminal courts increasingly rely upon scientific evidence provided by expert witnesses. This raises a number of questions for the courts including what type of science they should admit and who should be allowed to give such evidence. The admissibility framework for scientific evidence in England and Wales (E&W) originates from the 1975 case of *R v. Turner*, [1975] QB 834. Under *Turner*, expert evidence is admissible as long as it is beyond the understanding of the fact-finders. This common law framework has been interpreted and developed and it now consists of a mismatch of court decisions from E&W, Australia, Canada and the United States of America (US). This framework does not seem to reflect the four decades of significant scientific advances that have taken place since *Turner*. There have been a number of prominent trials in the US and in E&W where scientific evidence has been associated with an improper verdict. This paper suggests that controversies related to Shaken Baby Syndrome (SBS) / Abusive Head Trauma (AHT) expose the weaknesses of admissibility frameworks in the US and, more specifically, in E&W. It concludes that the triad of symptoms frequently used to diagnose SBS/AHT is not reliable, and that courts need to consider more closely significant advances in the understanding of the symptoms previously believed to indicate that an infant had been shaken, before admitting such evidence in court.

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I. INTRODUCTION

Forensic science, or “the application of science in the resolution of legal disputes”,¹ has become an integral part of the criminal justice systems in the United States of America (US) and in England and Wales (E&W). It is beneficial to the process of justice that scientific methods and techniques have the potential to draw links between victims, perpetrators and crime scenes.² Criminal and civil courts often rely upon scientific evidence provided by

* Senior Lecturer, Institute of Criminal Justice Studies, University of Portsmouth, 141 High Street, Portsmouth, PO1 2HY, UK; marika.henneberg@port.ac.uk.

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¹ ANDREW R.W. JACKSON & JULIE M. JACKSON, *FORENSIC SCIENCE* xv (2d ed. 2010).

² See EDMOND LOCARD, *TRAITÉ DE CRIMINALISTIQUE* (1940); *Id.*; STUART H. JAMES & JON J. NORDBY, *FORENSIC SCIENCE: AN INTRODUCTION TO SCIENTIFIC AND INVESTIGATIVE TECHNIQUES*, (3d ed. 2009); W. Jerry Chisum & Brent E. Turvey, *Evidence Dynamics: Locard's Exchange Principles & Crime Reconstruction*, 1(1) J. BEHAV. PROFILING (2000).

expert witnesses to settle different types of legal disputes. This inevitably increases the risk that ‘junk science’³ may be admitted in courts in the US and in E&W.⁴

It is, undoubtedly, a hard task for judges and jurors to adjudge topics which may have taken years for a scientist to become proficient in.⁵ Collecting, preparing, analysing and presenting scientific evidence all require high levels of training, expertise and skill, and it would be naive to suggest that the intricacies of any field of forensic science can be fully understood by judges, lawyers or jurors (or indeed scientists).⁶ Nevertheless, judges need to decide whether or not to admit scientific evidence, lawyers need to be able to use expert evidence to support their case and effectively challenge the views of the opposing side’s experts during cross examination, and jurors have the important task of deciding, based on the evidence that they have heard, whether the defendant is guilty or not.

Part II reviews the admissibility of scientific evidence in the US through an exploration of significant cases. The Supreme Court of the United States (USSC) confronted concerns that the US courts were admitting ‘junk science’ in a sequence of decisions in the 1990s.⁷ In effect, these decisions made it clear that judges had a ‘gate-keeping’ role to decide on the scientific validity of proffered expert evidence.⁸ Research and publications have since tried to identify what ‘science’ or research satisfy the USSC’s criteria, and to encourage the scientific education of lawyers and judges.⁹ The US approach to admissibility has been adopted by a number of Commonwealth jurisdictions,¹⁰ but never, formally, in the United Kingdom (UK).¹¹

Part III reviews the development of the common law admissibility framework in E&W. There have been a number of prominent trials in E&W where scientific evidence has been associated with an improper verdict.¹² The House of Commons’ Science and Technology Committee expressed concerns about the quality of scientific evidence being admitted by the courts in E&W in 2005, and the Law Commission of E&W was tasked with investigating the issue.¹³ The Law Commission confirmed that there were some serious problems and proposed a Bill.¹⁴ The Law Commission’s approach was not to focus upon the scientific status of the evidence proffered (which, broadly,

³ See PETER W. HUBER, *GALILEO’S REVENGE: JUNK SCIENCE IN THE COURT ROOM* (1991). The term ‘junk science’, despite not being coined by the author, gained popularity after the publication.

⁴ For the situation in the US, see COMMITTEE ON IDENTIFYING THE NEEDS OF THE FORENSIC SCIENCE COMMUNITY, NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADEMIES (NRC), *STRENGTHENING THE FORENSIC SCIENCES IN THE US: A PATH FORWARD* (The National Academies Press, 2009) [hereinafter NRC REPORT], and for England and Wales, see THE LAW COMMISSION, *THE ADMISSIBILITY OF EXPERT EVIDENCE IN CRIMINAL PROCEEDINGS IN ENGLAND AND WALES: A NEW APPROACH TO THE DETERMINATION OF EVIDENTIARY RELIABILITY* (2009), available at http://lawcommission.justice.gov.uk/docs/cp190_Expert_Evidence_Consultation.pdf [hereinafter THE LAW COMMISSION 2009].

⁵ For more comprehensive discussions on this see, e.g., Peter W. Huber, *Junk Science and the Jury*, U. CHI. LEGAL F. 273 (1990) and Edith Greene & Lawrence Wrightsman, *Decision Making by Juries and Judges: International Perspectives*, in *HANDBOOK OF PSYCHOLOGY IN LEGAL CONTEXTS*, 401-422 (Ray Bull & David Carson eds. 2d ed. 2003).

⁶ Greene & Wrightsman, *supra* note 5.

⁷ *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993); *General Electric Co. v. Joiner*, 522 U.S. 136 (1997); *Kumho Tire Co. Ltd. v. Carmichael*, 526 U.S. 137 (1999).

⁸ KARL POPPER, *THE LOGIC OF SCIENTIFIC DISCOVERY* (2d ed. 2002).

⁹ This includes the five volume multi-edition product edited by Faigman et al. (e.g. the 2013-2014 edition), see DAVID FAIGMAN ET AL., *MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY*, VOLS 1-5 (2013-2014) and the one-thousand page document by the Federal Judicial Center, see FEDERAL JUDICIAL CENTRE, *REFERENCE MANUAL ON SCIENTIFIC EVIDENCE* (3d ed. 2011), available at [http://www.fjc.gov/public/pdf.nsf/lookup/SciMan3D01.pdf/\\$file/SciMan3D01.pdf](http://www.fjc.gov/public/pdf.nsf/lookup/SciMan3D01.pdf/$file/SciMan3D01.pdf).

¹⁰ Simon A. Cole, *Splitting Hairs? Evaluating ‘Split Testimony’ as an Approach to the Problem of Forensic Expert Evidence*, 33 SYDNEY L. REV. 459 (2011).

¹¹ THE LAW COMMISSION 2009, *supra* note 4.

¹² Successful appeals include *R v. Dallagher*, [2002] EWCA Crim 1903 (appeal taken from Eng.) where ear print comparison evidence had been the major evidence in a murder conviction, and *R v. Clark* (No 2), [2003] EWCA Crim 1020 (appeal taken from Eng.), where improperly cited statistics and a failure to disclose results of medical tests had resulted in two murder convictions. These will be discussed in detail in Part III.

¹³ THE LAW COMMISSION 2009, *supra* note 4.

¹⁴ THE LAW COMMISSION, *EXPERT EVIDENCE IN CRIMINAL PROCEEDINGS IN ENGLAND AND WALES* (2011), available at http://lawcommission.justice.gov.uk/docs/lc325_Expert_Evidence_Report.pdf [hereinafter THE LAW COMMISSION 2011].

had been the USSC's approach), but rather its reliability.¹⁵ However, the Government rejected the proposals for reform in November 2013,¹⁶ citing expenses as one of the reasons for the rejection.¹⁷

Part IV considers medical and scientific evidence in relation to Shaken Baby Syndrome (SBS) / Abusive Head Trauma (AHT). Whilst medical evidence has a long history of recognition by the courts in the US and E&W, some diagnoses, such as Sudden Infant Death Syndrome (SIDS), have been associated with several alleged wrongful convictions, especially in E&W.¹⁸ SBS, now commonly referred to as Abusive Head Trauma (AHT),¹⁹ has also come under scrutiny after the triad of symptoms believed to be pathognomonic of SBS has been shown to have alternative natural or accidental explanations which do not indicate shaking.²⁰ In January, 2015 a group of international experts signed an open letter calling for a change in the way courts (in the US and the UK) use the "SBS construct",²¹ as "it does not have the undivided support of the relevant professional community, an essential consideration in the assessment of expert testimony."²² Controversies around the use of expert evidence relating to SBS/AHT in criminal trials have highlighted problematic issues inherent in the adversarial process in general, and in relation to the admissibility of such evidence in particular.

This article concludes that despite efforts to prevent unreliable science from being admitted in court,²³ unreliable or outdated science is still a major part of the SBS/AHT diagnosis in the US and, especially, in E&W. This article suggests that medical and scientific evidence relating to SBS/AHT should no longer be considered reliable, and that courts need to consider significant developments in the understanding of the symptoms used to diagnose SBS/AHT²⁴ to avoid wrongful convictions.

II. ADMISSIBILITY OF SCIENTIFIC EVIDENCE IN THE UNITED STATES OF AMERICA

Before the 1920s, courts in the US had applied what some scholars today refer to as the "marketplace test"²⁵ when considering admissibility. Under the test, any expert or expertise that consumers had been willing to spend money on would be considered sound enough for courts.²⁶ This raised problems as the market would not necessarily consider the reliability or validity of an opinion, as expertise of doubtful quality and soundness "may nevertheless sell well"²⁷. In addition, markets may not necessarily reflect the needs of the courts.²⁸ Concerns about the reliability of certain scientific practices were recognised in the 1920s,²⁹ and admissibility frameworks have since evolved.

A. *FRYE V. UNITED STATES*, 293 F. 1013 (DC CIRCA. 1923)

The first important case to deal with admissibility of newly developed areas of science was the 1923 case of *Frye v. United States*.³⁰ In that case, James Frye had been convicted of murder in the second degree.³¹ During the

¹⁵ *Id.*

¹⁶ MINISTRY OF JUSTICE, THE GOVERNMENT'S RESPONSE TO THE LAW COMMISSION REPORT: "EXPERT EVIDENCE IN CRIMINAL PROCEEDINGS IN ENGLAND AND WALES" (LAW COM No 325), 2013 (Eng. Wales), *available at* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/260369/govt-resp-experts-evidence.pdf.

¹⁷ Skills for Justice, *Expert Evidence Changes Rejected*, SKILLS FOR JUSTICE, (Nov. 22, 2013, 8:45 AM), <http://www.sfkuk.com/expert-evidence-changes-rejected/>.

¹⁸ John Hartshorne & José Miola, *Expert Evidence: Difficulties and Solutions in Prosecutions for Infant Harm*, 30(2) LEGAL STUD. 279 (2010); THE LAW COMMISSION 2009, *supra* note 4; THE LAW COMMISSION 2011, *supra* note 14.

¹⁹ For the purpose of this paper the terms used are Shaken Baby Syndrome (SBS) and Abusive Head Trauma (AHT). A number of scholarly papers have used alternative terms such as Non-Accidental Head Trauma/Injury, Shaken Impact Injury and Acquired Brain Injury to describe the same issue.

²⁰ See, e.g., Keith A. Findley et al., *Shaken Baby Syndrome, Abusive Head Trauma, and Actual Innocence: Getting it Right*, 12 HOUS. J. HEALTH L. & POL. 209 (2012).

²¹ Lynne Wrennall et al., *Argument & Critique: Open Letter on Shaken Baby Syndrome and Courts: A False and Flawed Premise* (2015), *available at* <https://globalwrong.files.wordpress.com/2015/02/open-letter-on-sbs.pdf>.

²² *Id.*

²³ See *supra* note 4.

²⁴ Findley et al., *supra* note 20.

²⁵ E.g. Michael J. Saks & David L. Faigman, *Expert Evidence after Daubert*, 1 ANN. REV. L & SOC. SCI 105 (2005).

²⁶ *Id.* at 107.

²⁷ *Id.*

²⁸ Roselle L. Wissler, Keelah E.G. Williams & Michael J. Saks, *How Legal Tests for the Admissibility of Scientific Evidence Resemble Cognitive Science's System 1 and System 2*, 17(4) VA. J.L. & TECH. 354, 364 (2013).

²⁹ *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923).

³⁰ *Id.*

³¹ *Id.* at 1013.

original trial, defence counsel had asked that the result of a systolic blood pressure deception test was admitted as evidence, or that Frye should be subjected to such a test in the presence of the jury.³²

The claim was that this early predecessor to the polygraph, or lie detector, would detect changes in the systolic blood pressure when nervous impulses were sent to the autonomic nervous system, and that these changes corresponded to changes in the person's emotions.³³ Scientific experiments were believed to demonstrate how "conscious deception or falsehood, concealment of facts, or guilt of crime, accompanied by fear of detection when the person is under examination, raises the systolic blood pressure in a curve."³⁴ This curve would allegedly correspond to the struggle going on in the subject's mind, "between fear and attempted control of that fear, as the examination touches the vital points of which he is attempting to deceive the examiner."³⁵

Although no cases had been found which directly dealt with systolic blood pressure tests, defense counsel in *Frye* maintained that there was a general rule,³⁶ which suggested that opinions of witnesses skilled in a particular science, art or trade were admissible in evidence if the question involved required special experience or knowledge.³⁷ This would be the case with the systolic blood pressure test, as it required the testimony of a person with special knowledge and experience.³⁸

The appeal court in *Frye* did not oppose to this, but it challenged the methodology for the systolic blood pressure machine.³⁹ The court acknowledged that the level of confidence in a particular scientific methodology needed to be determined before it could be admitted in evidence, and that a threshold test would be required.⁴⁰ The court held that: "Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define,"⁴¹ and that "the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs".⁴² The court believed that the systolic blood pressure deception test had not yet gained such standing and scientific recognition among physiological and psychological authorities that it should be admitted in court.⁴³

Frye provides that if the methodology at issue is "generally accepted" by the relevant scientific community within which it belongs, it should be acceptable to the law and hence admissible in court.⁴⁴ This was a major advancement from the marketplace test as, instead of looking at the consumers of the expertise, there was a shift to look at the experts and their credentials, as well as the body of knowledge surrounding the topic.⁴⁵ It is easy to assume that the majority view will be the one that is deemed generally accepted, but general acceptance "is only a very rough proxy for scientific validity."⁴⁶ New discoveries or techniques may be developed by a minority part of the scientific community, and may take years to gain a wider acceptance.⁴⁷

³² *Id.*

³³ *Id.*

³⁴ *Id.* at 1014.

³⁵ *Id.*

³⁶ *Id.*

³⁷ *Id.*

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ *Id.*

⁴² *Id.*

⁴³ *Id.*

⁴⁴ This is often referred to as the 'general acceptance test', see *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923).

⁴⁵ Saks & Faigman, *supra* note 25, at 107.

⁴⁶ PAUL ROBERTS & ADRIAN ZUCKERMAN, CRIMINAL EVIDENCE (2d ed. 2010) at 497.

⁴⁷ *Id.*

Frye continues to be the admissibility test in California,⁴⁸ Illinois,⁴⁹ Maryland,⁵⁰ Minnesota,⁵¹ New Jersey,⁵² New York,⁵³ Pennsylvania⁵⁴ and Washington,⁵⁵ whereas Florida replaced it 2013⁵⁶ and Kansas in 2014.⁵⁷

B. *DAUBERT V. MERRELL DOW PHARMACEUTICALS, INC.*, 509 US 579 (1993)

The USSC reformed the general acceptance test from *Frye* in the 1993 case of *Daubert v. Merrell Dow Pharmaceuticals, Inc.*⁵⁸ The petitioners in that case were Jason Daubert and Eric Schuller, two minor children born with serious birth defects, and their parents.⁵⁹ Claiming that the birth defects had been caused by the anti-nausea drug Bendectin, which had been ingested by the two mothers whilst pregnant, the petitioners had sued Merrell Dow Pharmaceuticals (MDP), the marketer of the drug, in California state court.⁶⁰

MDP had moved for summary judgment, stating that there was no evidence to suggest that Bendectin caused birth defects in humans.⁶¹ A physician and epidemiologist, acting as an expert for MDP, examined over 30 published studies on Bendectin and human birth defects.⁶² Bendectin had not been found to be a human teratogen (a substance capable of causing malformation in fetuses) in any of the published studies which covered more than 130,000 patients.⁶³

The petitioners did not contest the summary of the studies provided by MDP's expert.⁶⁴ However, they countered this conclusion with testimonies from eight different experts, all with impressive credentials.⁶⁵ These experts drew the conclusion that there was a link between Bendectin and birth defects based on malformations that had been found in various studies. These studies included animal studies (both in test tube (in vitro) and live (in vivo) studies), and pharmacological studies, which showed that Bendectin had a similar structure to other drugs known to cause birth defects. They also shaped their conclusions through "the "reanalysis" of previously published epidemiological (human statistical) studies."⁶⁶

The District Court granted MDP's motion for summary judgment, stating that scientific evidence would be admissible only where the principle upon which it is based is "sufficiently established to have general acceptance in the field to which it belongs."⁶⁷ The District Court held that the evidence the petitioners presented did not meet this standard. This was because it was based on recalculations of data in previously published studies, animal studies and chemical-structure analyses.⁶⁸ In order to establish causation (and be admissible), the court opined that the expert opinion evidence should be based on epidemiological data concerning Bendectin.⁶⁹ Furthermore, the evidence the petitioners sought to rely upon had neither been subjected to peer review nor been published.⁷⁰

The United States Court of Appeals for the Ninth Circuit affirmed, stating that expert opinion "based on scientific technique is inadmissible unless the technique is "generally accepted" as reliable in the relevant scientific community",⁷¹ and that any expert opinion which diverges significantly from the procedures or methodology

⁴⁸ California Evidence Code §801.

⁴⁹ Rule 702, Illinois Rules of Evidence.

⁵⁰ *Frye* was adopted in Maryland in *Reed v. State*, 283 Md. 374, 391 A.2d 364 (Md., 1978).

⁵¹ Rule 702, Minnesota Court Rules.

⁵² Rule 703, New Jersey Rules of Evidence.

⁵³ N.Y. C.P.L.R. §4515; *Giordano v. Market Am., Inc.*, 15 N.Y.3d 590, 601, 941 N.E.2d 727, (2010); *People v. Kanani*, 272 A.D.2d 186, 186, 709 N.Y.S.2d 505 (1st Dept. 2000).

⁵⁴ Rule 702, Pennsylvania Rules of Evidence.

⁵⁵ Rule 703, Washington Rules of Evidence.

⁵⁶ Florida Evidence Code 90.702.

⁵⁷ Kansas Statutes Annotated 60-456.

⁵⁸ *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993).

⁵⁹ *Id.* at 2791.

⁶⁰ *Id.*

⁶¹ *Id.*

⁶² *Id.*, more than 130,000 patients were included in the studies.

⁶³ *Id.*

⁶⁴ *Id.*

⁶⁵ *Id.*

⁶⁶ *Id.* at 2791-92.

⁶⁷ *Id.* at 2792, citing *United States v. Kilgus*, 571 F.2d 508, 510 (CA9 1978).

⁶⁸ *Id.* at 2792.

⁶⁹ *Id.*

⁷⁰ *Id.*

⁷¹ *Id.*

accepted in that particular field cannot be considered reliable, and is therefore inadmissible.⁷² Unpublished reanalyses, where the outcome was significantly different to the original published analyses, were problematic, as no scrutiny and/or verification of those results had taken place.⁷³

The USSC granted certiorari in order to determine whether the *Frye* test was still good law, and if it was, whether the test should require that expert scientific testimony had been subjected to peer review in order to be admissible.⁷⁴ Following discussions around Federal Rule of Evidence 702, the USSC decided that evidence would need to be both reliable and relevant to be admissible.⁷⁵

In summary, *Daubert* lists five key factors that courts should consider when determining whether expert scientific testimony is scientifically valid and reliable. These factors are whether a theory, method or technique (1) can or has been tested; (2) has been subjected to scrutiny through peer review and publication; (3) has a known or potential rate of error; (4) has existing standards and controls; and (5) has been generally accepted by a relevant scientific community.⁷⁶ However, these key factors do not constitute a check list and there is a need for flexibility.⁷⁷

C. THE DAUBERT TRILOGY

The current federal standard for admissibility of scientific expert evidence in the US has been established through three cases in particular, commonly referred to as the *Daubert* Trilogy. Although this standard is not universally incorporated at state level, many states have adopted it. The USSC revisited the issue of admissibility in *General Electric Co v. Joiner*⁷⁸ and *Kumho Tire Co Ltd v. Carmichael*⁷⁹ in order to clarify *Daubert* further.

In 1983, Georgia City discovered that the dielectric fluid in some of its transformers were contaminated with polychlorinated biphenyls (PCBs), known to be hazardous to the health of humans.⁸⁰ Robert Joiner worked as an electrician for Georgia City from 1973 and came in contact with PCBs in the course of his employment.⁸¹ In 1991, Joiner was diagnosed with small cell lung cancer and in 1992 he sued General Electric Co., the manufacturer of the transformers and the dielectric fluid, in a Georgia state court.⁸² Joiner's law suit "alleged that his exposure to PCBs "promoted" his cancer; had it not been for his exposure to these substances, his cancer would not have developed for many years, if at all."⁸³ Joiner provided the court with a number of depositions by expert witnesses which stated that PCBs and their derivatives can promote cancer and that these were the likely source of his cancer.⁸⁴ However, Joiner had also been a smoker for eight years and there was a history of lung cancer in his family.⁸⁵

The case was moved to the District Court by General Electric. Although the District Court stated that there was a genuine issue of material fact as to whether Joiner had been exposed to PCBs, it granted General Electric's request for summary judgment.⁸⁶ The reasons for this was that there was no evidence that Joiner had suffered significant exposure to PCBs and that Joiner's experts had failed to establish a causal link between PCBs and small cell lung cancer.⁸⁷ The expert evidence presented by Joiner was held to be inadmissible as, according to the District Court, it was based on "subjective belief or unsupported speculation."⁸⁸

⁷² *Id.*

⁷³ *Id.*

⁷⁴ *Id.* at 2793.

⁷⁵ *Id.* at 2794-95. In brief, Rule 702 provides that scientific knowledge may be presented in court by a qualified witness if it assists the trier of fact to understand the evidence.

⁷⁶ *Daubert*, 509 U.S.

⁷⁷ See, e.g., ROBIN T. BOWEN, ETHICS AND THE PRACTICE OF FORENSIC SCIENCE 69 (2010).

⁷⁸ *General Electric Co. v. Joiner*, 522 U.S. 136 (1997).

⁷⁹ *Kumho Tire Co. Ltd. v. Carmichael*, 526 U.S. 137 (1999).

⁸⁰ *Joiner*, 522 U.S. at 136.

⁸¹ *Id.* at 139.

⁸² *Id.*

⁸³ *Id.* at 139-40.

⁸⁴ *Id.* at 139.

⁸⁵ *Id.*

⁸⁶ *Id.* at 140.

⁸⁷ *Id.*

⁸⁸ *Id.* at 136.

The Court of Appeals for the Eleventh Circuit reversed this decision, based on two fundamental errors in the District Court's judgment.⁸⁹ In the Eleventh Circuit's opinion, the District Court should not have excluded the expert testimony as its role should only be to determine the legal reliability of the evidence.⁹⁰ Deciding on the weight of competing expert testimonies should be a question for the jury and the court should not exclude testimony because it draws a different conclusion than the experts.⁹¹ The Eleventh Circuit also found that there was evidence on record that supported the proposition that Joiner had been exposed to furans and dioxins.⁹²

The USSC granted certiorari and subsequently reversed the Eleventh Circuit's judgment, affirming the previous ruling by the District Court.⁹³ The USCC confirmed that the abuse of discretion standard should be used when reviewing a District Court's decision to admit or exclude expert scientific evidence,⁹⁴ and that a proper application of this standard would indicate that the District Court did not abuse its discretion when it excluded the evidence, as the studies were significantly dissimilar to the facts of the case.⁹⁵ The evidence which Joiner had presented was based on studies conducted on mice, none of which had actually demonstrated that adult mice developed cancer after exposure to PCBs.⁹⁶ Thus, the USCC decision in *Joiner* verified that trial judges have a gate-keeping role and may exclude expert evidence where there are analytical gaps between the data and the opinions proffered.⁹⁷

In *Kumho Tire Co Ltd v. Carmichael*⁹⁸ in 1999, the USSC had the opportunity to review how the *Daubert* ruling applied to evidence provided by experts other than scientists. In 1993, Patrick Carmichael was driving a minivan when a rear tire blew out, causing the vehicle to overturn.⁹⁹ One of his passengers was killed and several other were severely injured in the accident. The Carmichaels, survivors of the accident and representatives of the deceased, sued the maker of the tire, Kumho Tire Company, and the distributors, claiming that the tire was defective.¹⁰⁰

The Carmichaels relied on expert testimony provided by a senior engineer who specialised in tire failure analysis.¹⁰¹ The engineer had concluded that the accident was caused by a defect in the design or manufacturing of the tire.¹⁰² However, as the engineer had relied on methodology which was partly disputed, Kumho Tire Company asked the District Court to exclude this testimony.¹⁰³ The District Court agreed that the methodology did not satisfy current standards under Federal Rule of Evidence 702 as it was insufficiently reliable.¹⁰⁴ The testimony was excluded and Kumho Tire Company was granted a summary judgment.¹⁰⁵

The Court of Appeals for the Eleventh Circuit reversed this judgment, stating that a federal trial judge's gate-keeping role was limited to scientific testimony.¹⁰⁶ The District Court should not have excluded the testimony from an engineer, which the Eleventh Circuit referred to as being based on skills and experience.¹⁰⁷

The USSC granted certiorari to determine whether a federal trial judge's gate-keeping obligations were limited to scientific evidence or if this should apply to testimonies which were based on skills and experience as well.¹⁰⁸ In a unanimous decision, the USSC held that the gate-keeping obligations should apply to all expert evidence as it was virtually impossible to distinguish between technical and scientific knowledge and that "conceptual efforts to distinguish the two are unlikely to produce clear legal lines capable of application in particular cases."¹⁰⁹ The USSC further concluded that the District Court had acted within its discretion when it determined that the

⁸⁹ *Id.* at 140.

⁹⁰ *Id.* at 141.

⁹¹ *Id.*

⁹² *Id.*

⁹³ *Id.*

⁹⁴ *Id.*

⁹⁵ *Id.* at 144-45.

⁹⁶ *Id.* at 144.

⁹⁷ See in particular Justice Breyer's concurring opinion, *id.* at 147-49.

⁹⁸ *Kumho Tire Co. Ltd. v. Carmichael*, 526 U.S. 137 (1999).

⁹⁹ *Id.* at 137.

¹⁰⁰ *Id.*

¹⁰¹ *Id.*

¹⁰² *Id.*

¹⁰³ *Id.*

¹⁰⁴ *Id.*

¹⁰⁵ *Id.*

¹⁰⁶ *Id.*

¹⁰⁷ *Id.*

¹⁰⁸ *Id.* at 138.

¹⁰⁹ *Id.* at 148.

methodology used by the engineer was unreliable and excluded this testimony.¹¹⁰ Thus, *Kumho Tire* verified that trial judges were not only the gate-keepers of scientific evidence, but that the discretion to admit or exclude extended to all types of expert evidence.¹¹¹

D. THE US FEDERAL RULES OF EVIDENCE

The Federal Rules of Evidence (FRE) were developed in 1973 by codifying existing USSC decisions and common evidentiary rules in place at the time,¹¹² and these were enacted and incorporated into statutory law in 1975.¹¹³

Rule 702, Testimony by Witness, states that:

“A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:

- (a) the expert’s scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
- (b) the testimony is based on sufficient facts or data;
- (c) the testimony is the product of reliable principles and methods; and
- (d) the expert has reliably applied the principles and methods to the facts of the case.”¹¹⁴

The spirit of *Daubert* is obvious in the text of FRE 702.¹¹⁵ However, Rule 702 needs to be considered alongside Rule 703, Bases of an Expert’s Opinion Testimony, and Rule 705, Disclosing the Facts or Data Underlying an Expert’s Opinion.

Rule 703 states that:

“An expert may base an opinion on facts or data in the case that the expert has been made aware of or personally observed. If experts in the particular field would reasonably rely on those kinds of facts or data in forming an opinion on the subject, they need not be admissible for the opinion to be admitted. But if the facts or data would otherwise be inadmissible, the proponent of the opinion may disclose them to the jury only if their probative value in helping the jury evaluate the opinion substantially outweighs their prejudicial effect.”¹¹⁶

Rule 703 has attracted criticism for allowing evidence which would be inadmissible under other rules to be brought in ‘through the back door’.¹¹⁷ This is because experts are still allowed to rely on such information and facts and may, in some circumstances, even be allowed to disclose this inadmissible information to the jury.¹¹⁸ In addition, under FRE Rule 705, experts *may* choose to disclose information underlying their opinion evidence, but they are not required to do so.¹¹⁹ However, even if such information is not disclosed as part of the opinion evidence given, the opposing party may still try to establish the basis for the expert’s opinion during cross-examination.¹²⁰

The legal frameworks for admissibility have evolved over the last century, with the courts and legislatures attempting to acknowledge that science must be both relevant and reliable in order to be used in the legal process. The law governing admissibility has also developed over decades in E&W as Part III will explain.

III. ADMISSIBILITY OF SCIENTIFIC EVIDENCE IN ENGLAND AND WALES

¹¹⁰ *Id.* at 139.

¹¹¹ *Id.* at 158.

¹¹² BOWEN, *supra* note 77, at 66.

¹¹³ David G. Owen, *A Decade of Daubert*, 80 DENV. U. L. REV. 345, 355 (2002-2003).

¹¹⁴ FEDERAL EVIDENCE REVIEW, FEDERAL RULES OF EVIDENCE 2015, 30 (2015), available at <http://federalevidence.com/downloads/rules.of.evidence.pdf>.

¹¹⁵ Surprisingly, *Daubert* was not incorporated into the FRE until 2001. Up until then, FRE 702 allowed the admission of scientific or technical evidence by a qualified expert if such testimony would assist the trier of fact. See Owen, *supra* note 113, at 358, 361.

¹¹⁶ FEDERAL EVIDENCE REVIEW, *supra* note 114.

¹¹⁷ Ian Volek, *Federal Rule of Evidence 703: The Back Door and the Confrontation Clause, Ten Years Later*, 80 FORDHAM L. REV. 959, 963 (2011).

¹¹⁸ *Id.* at 985.

¹¹⁹ *Id.* at 969.

¹²⁰ FEDERAL EVIDENCE REVIEW, *supra* note 114, at 31.

The admissibility framework for scientific evidence in E&W originates from the 1975 case *R v. Turner*.¹²¹ This framework has been criticised for being unclear, with scholars such as Roberts and Zuckerman stating that this precedent, “to where many of the phantom ‘rules’ trace their origin, has been especially vulnerable to misinterpretation.”¹²² Furthermore, with the significant advances in science over the last fifty years, it has been argued that the common law approach to the admissibility of science in E&W is outdated and needs to be reformed.¹²³

A. THE COMMON LAW ADMISSIBILITY TEST

The body of law relating to the admissibility of opinion evidence provided by expert witnesses in criminal proceedings in E&W has developed within the common law, and is referred to as “the common law admissibility test.”¹²⁴ It is generally accepted that there are four requirements which need to be satisfied under the common law test in order for an expert’s opinion evidence to be admissible.¹²⁵ These are: assistance, relevant expertise, impartiality and evidentiary reliability.¹²⁶ Each requirement has its own set of rules, which will be explored further.

i. Assistance

The assistance requirement originates from the judgment in *R v. Turner*.¹²⁷ In *Turner*, the defendant had repeatedly hit his girlfriend with a hammer after she told him that the child she was carrying was not his.¹²⁸ The defense wanted to call a psychiatrist to provide expert opinion evidence that the defendant’s personality meant that, although he did not show any signs of mental illness, he killed his girlfriend in “an explosive release of blind rage.”¹²⁹

The court confirmed that an expert’s opinion would be admissible “to furnish the court with scientific information which is likely to be outside the experience and knowledge of a judge or jury.”¹³⁰ The court further suggested that such evidence would be unnecessary (and therefore inadmissible) where the judge or jury could form their own conclusions “without help.”¹³¹ The psychiatrist’s evidence was not admissible, as, in the words of Lawton LJ, people “who are deeply in love can, and sometimes do, have outbursts of blind rage when discovering unexpected wantonness on the part of their loved ones ... Jurors do not need psychiatrists to tell them how ordinary folk who are not suffering from any mental illness are likely to react to the stresses and strains of life.”¹³² Twenty years later, the Canadian Supreme Court noted, in *R v. Mohan*,¹³³ that “to be admissible an expert’s evidence is “necessary” only in the limited sense that it has to provide helpful information which is likely to be outside a judge or jury’s knowledge and experience.”¹³⁴ This rationale has subsequently been imported by courts in E&W.

ii. Relevant expertise

The requirement of relevant expertise comes with two general assumptions. First, that there is a recognisable relevant field within which the issue at hand can be classified,¹³⁵ and secondly, that it is possible to gain expertise within this particular field.¹³⁶ The Law Commission has stated that in order to give expert evidence at trial, the individual “claiming expertise must be an expert in the relevant field.”¹³⁷

¹²¹ *R v. Turner*, [1975] 1 All ER 70.

¹²² ROBERTS & ZUCKERMAN, *supra* note 46, at 483.

¹²³ This is clearly highlighted by the Law Commissions efforts in 2009 and 2011. See THE LAW COMMISSION 2009, *supra* note 4; THE LAW COMMISSION 2011, *supra* note 14.

¹²⁴ THE LAW COMMISSION 2011, *supra* note 14, at 13.

¹²⁵ *Id.*

¹²⁶ *Id.*

¹²⁷ *R v. Turner*, [1975] 1 All ER 70.

¹²⁸ CHRISTOPHER ALLEN, PRACTICAL GUIDE TO EVIDENCE 377 (4th ed. 2008). *Id.*

¹²⁹ *Id.*

¹³⁰ *R v. Turner*, [1975] 1 All ER 70 at 841.

¹³¹ *Id.*

¹³² *Id.*, emphasis added.

¹³³ *R v. Mohan*, [1994] 2 SCR 9, 10f (appeal taken from Can.)

¹³⁴ THE LAW COMMISSION 2011, *supra* note 14, at 13.

¹³⁵ ROBERTS & ZUCKERMAN, *supra* note 46, at 496.

¹³⁶ *Id.*

¹³⁷ THE LAW COMMISSION, *supra* note 14, at 13.

Notably, a lack of formal qualifications will not prevent a person from being seen as a competent expert witness. This was first seen in the 1894 case of *R v. Silverlock*,¹³⁸ where it was established that a person did not need formal or rigorous training to be seen as an expert, as long as their informal interest and study of the subject was sufficient.¹³⁹

In 1984, the requirement of relevant expertise was outlined by the Supreme Court of South Australia in *R v. Bonython*,¹⁴⁰ a judgment which has frequently been cited by the Court of Appeal (Criminal Division) (CACD) for E&W. The defendant in *Bonython* had been convicted of forgery after falsifying a victim's signature to obtain money. In the judgment it was stated by King CJ that relevant expertise would be where "the witness has acquired by study or experience sufficient knowledge of the subject to render his [or her] opinion of value in resolving the issues before the court."¹⁴¹ The court confirmed that expert opinion evidence provided by a police sergeant who had acquired expertise in the comparison of handwriting and identification of signatures (a recognised field for expert testimony), was admissible even though this expertise did not come from a formal course or study.¹⁴²

There have been some restraints on the admission of irrelevant expertise in the courts in E&W. For example, in the 1991 case of *R v. Robb*,¹⁴³ it was suggested that expert opinion evidence by an amateur psychologist would be inadmissible.¹⁴⁴ Nevertheless, the use of expert witnesses without formal qualifications has been seen frequently, for example in the 2003 case of *R v. Hodges*,¹⁴⁵ where drug-squad officers were allowed to give evidence on street prices and other issues relating to the drugs trade.¹⁴⁶

The Law Commission has recommended that the threshold for determining relevant expertise should be threefold and include: "a requirement of proof on the balance of probabilities";¹⁴⁷ that "amateurs are not qualified to give some types of expert evidence";¹⁴⁸ and that some fields, such as DNA analysis, already have explicit guidelines for determining expertise.¹⁴⁹

iii. Impartiality

It has been suggested that the CACD never tires of saying that the professional duties of expert witnesses are "owed to the court and override any obligation to the person from whom the expert has received instructions or by whom the expert is paid. It is hardly necessary to say that experts should maintain professional objectivity and impartiality at all times."¹⁵⁰ Indeed, it is explicitly set out in Rule 33.2 of the Criminal Procedure Rules 2013¹⁵¹ that an expert's duty is to give objective and unbiased opinion evidence to the court based on matters within their expertise.¹⁵² However, the CACD made it clear in *R v. Stubbs*¹⁵³ that apparent bias does not necessarily make an expert's evidence inadmissible.¹⁵⁴ In *Stubbs*, fraudulent money transfers had been made from the HSBC Bank. One of the prosecution's experts was an employee of the HSBC who had headed the internal investigation into the money transfers.¹⁵⁵ The CACD confirmed that the expert's employment and the importance of the case to the HSBC did not disqualify the expert from giving expert evidence.¹⁵⁶ The court considered that "it was a matter for the jury to determine whether there was any conscious or unconscious bias or lack of objectivity" and that this was related to the weight of the evidence rather than its admissibility.¹⁵⁷

¹³⁸ *R v. Silverlock*, [1894] 2 Q.B. 766 (Eng.).

¹³⁹ *Id.*

¹⁴⁰ *R v. Bonython*, (1984) 38 SASR 45.

¹⁴¹ *Id.*

¹⁴² *Id.*

¹⁴³ *R v. Robb*, [1991] 93 Cr App R 161.

¹⁴⁴ *Id.*

¹⁴⁵ *R v. Hodges*, [2003] EWCA Crim 290.

¹⁴⁶ *Id.*

¹⁴⁷ THE LAW COMMISSION, *supra* note 14, at 14.

¹⁴⁸ *Id.*

¹⁴⁹ *Id.*

¹⁵⁰ See ROBERTS & ZUCKERMAN, *supra* note 46, at 509, citing *R v. Bowman*, [2006] EWCA Crim 417.

¹⁵¹ Part 33 of the Criminal Procedure Rules as in force on 7 October 2013, available at <http://www.justice.gov.uk/courts/procedure-rules/criminal/docs/2012/crim-proc-rules-2013-part-33.pdf>.

¹⁵² *Id.* at Rule 33.2.

¹⁵³ *R v. Stubbs*, [2006] EWCA Crim 2312.

¹⁵⁴ *Id.* at [68].

¹⁵⁵ *Id.* at [26].

¹⁵⁶ *Id.* at [59].

¹⁵⁷ *Id.*

Referring to both *Bonython* and *Stubbs*, the court in *Leo Sawrij v. North Cumbria Magistrates' Court*¹⁵⁸ in 2009 also confirmed that a commercial relationship with a party to the litigation will not disqualify a person as an expert, as "it is not appropriate in criminal cases to rule an expert's evidence as inadmissible simply on the basis that he has some connection with the party who is intending to call him."¹⁵⁹ The court also made the point that any difference in approach to impartiality in civil cases was of no relevance as this was a criminal case.¹⁶⁰

iv. Evidentiary reliability

The requirement of evidentiary reliability has become somewhat unclear in E&W. Trial and appellate courts have relied on a mixture of judgments to interpret this requirement, including the US case of *Frye* and the Australian case of *Bonython*.

Although concerned with psychological evidence rather than 'hard science', the case of Edward Gilfoyle provides a good illustration of the blurred situation in E&W.¹⁶¹ Gilfoyle was convicted of his heavily pregnant wife Paula's murder in 1993, the year after she had been found dead hanging from a ceiling beam in the couple's garage.¹⁶² The prosecution alleged that Gilfoyle somehow made his wife write a suicide note and then forced or tricked her to climb a ladder in the garage and put her head through the noose.¹⁶³

For the trial, psychologist Professor David Canter¹⁶⁴ had been asked by the police to examine notes that Gilfoyle and Paula had written, including a suicide note from Paula that had been found in their house.¹⁶⁵ This was done in an attempt to decide whether the notes were written by Paula or dictated by Gilfoyle, and whether it was her intention to kill herself.¹⁶⁶ Without having done anything of this nature before, and without being allowed to speak to either Gilfoyle or anyone from Paula's family, Professor Canter came to the conclusion that Paula "had probably not written the note with the intention of killing herself."¹⁶⁷ The 'psychological autopsy' that Canter had produced was found to be inadmissible and thus never used in court.¹⁶⁸ However, Canter has stated that even though it was never used "the report itself bolstered the determination on the prosecution."¹⁶⁹ With the absence of any hard evidence, the defense had difficulties opposing any of the claims made by the prosecution.¹⁷⁰

Following Gilfoyle's conviction, Professor Canter re-examined the case and carried out additional research. During the second appeal in 2001, *R v. Gilfoyle (No 2)*,¹⁷¹ Gilfoyle's defense wanted to use Canter's more comprehensive 'psychological autopsy' which now stated that the evidence demonstrated that Paula *had* killed herself.¹⁷² The CACD confirmed that in accordance with *R v. Strudwick and Merry*,¹⁷³ the guiding principle appeared to be in line with the *Frye* test, namely that to be admissible, new and developing areas of science must be accepted by the scientific community as being able to provide an accurate and reliable opinion.¹⁷⁴ The CACD concluded that "the present academic status of psychological autopsies is not, in our judgment, such as to permit them to be admitted as a basis for expert opinion before a jury."¹⁷⁵

It is perhaps surprising that the CACD seemingly decided to adopt the *Frye* test to keep this form of evidence out of the court room, as this test had already been replaced in several US jurisdictions in favour of *Daubert* by that

¹⁵⁸ *Leo Sawrij v. North Cumbria Magistrates' Court*, [2009] EWHC 2823.

¹⁵⁹ *Id.* at [23].

¹⁶⁰ *Id.*

¹⁶¹ *R v. Gilfoyle (No 2)*, [2001] 2 Cr App R 5.

¹⁶² *Id.* at [1].

¹⁶³ *R v. Gilfoyle*, [1996] 1 Cr App R 302.

¹⁶⁴ Professor Canter's biography and resume can be viewed here: <http://www.davidcanter.com/> (last visited Aug. 17, 2015).

¹⁶⁵ David V. Canter, *Suicide or murder? Implicit narratives in the Eddie Gilfoyle case*, in THE FORENSIC PSYCHOLOGIST'S CASEBOOK: PSYCHOLOGICAL PROFILING AND CRIMINAL INVESTIGATION, 315, 319 (Laurence Alison ed., 2005).

¹⁶⁶ *Id.* at 320.

¹⁶⁷ *Id.* at 321.

¹⁶⁸ *Id.*

¹⁶⁹ *Id.*

¹⁷⁰ See *R v. Gilfoyle*, [1996] 1 Cr App R 302 and *R v. Gilfoyle (No 2)*, [2001] 2 Cr App R 5. It may also be argued that the report by Professor Canter could have led to case construction, see Marika L. Henneberg & Barry W. Loveday in this Special Issue.

¹⁷¹ *R v. Gilfoyle (No 2)*, [2001] 2 Cr App R 5.

¹⁷² Canter, *supra* note 165, at 321; *R v. Gilfoyle (No 2)*, [2001] 2 Cr App R 5.

¹⁷³ *R v. Strudwick and Merry*, [1993] 99 Cr App R 326.

¹⁷⁴ *Id.* at 332; D.C. Ormerod & Clare Barsby, *Case Comment – Evidence: murder – whether "psychological autopsy" of victim admissible, to show likelihood of suicide*, CRIM. L. REV. 312, 313 (2001).

¹⁷⁵ *R v. Gilfoyle (No 2)*, [2001] 2 Cr App R 5, [25].

time. Even though the criteria for assessing evidentiary reliability were not clearly explained in case law for E&W, Ormerod and Barsby suggested that the apparent approval of *Frye* by the CACD “could well create difficulties.”¹⁷⁶ In particular, the *Frye* test seems to contradict the 1991 decision by the CACD in *Robb*,¹⁷⁷ where it was suggested that the minority view of phoneticians¹⁷⁸ was admissible, and the common law principle verified in *R v Clarke*,¹⁷⁹ that it would be wrong to exclude evidence which would be of advantage to the court simply because it is based on new techniques or advances in science not yet recognised by the courts.¹⁸⁰

A significant case which drew attention to the important issue of evidentiary reliability was that of Mark Dallagher, who was convicted of murder in 1998 based on ear print comparison evidence.¹⁸¹ The victim had been killed in her bed during a break-in and the perpetrator left ear prints on a window. During the trial, the prosecution had relied on the testimony of two experts in ear print comparisons.¹⁸² In the appeal, it was argued by Dallagher that the jury should not have been allowed to hear the ear print comparison evidence as there were misgivings about the accuracy of such evidence.¹⁸³ The CACD decided that the evidence was admissible.¹⁸⁴ However, the Court also noted that if the jury had heard evidence from three forensic scientists that questioned the reliability of ear print comparison evidence, available at the appeal, it was reasonable to assume that this would have had an impact on the jury’s decision to convict.¹⁸⁵ However, the CACD also stated that “the trial judge could not possibly have concluded that the Crown’s expert evidence was irrelevant, or so unreliable that it should be excluded.”¹⁸⁶

Dallagher’s appeal was allowed and a retrial was ordered. However, the retrial came to a halt after only ten days. In January 2004 all charges against Dallagher were formally dropped after it was confirmed that DNA recovered from the ear print excluded him as the donor.¹⁸⁷ In this case, DNA clearly showed that the ear print evidence used in the trial had been unreliable.

It is worth noting that if the court in *Dallagher* had adopted the *Frye* test, it would have been clear from US cases that ear print comparison techniques were not generally accepted by the scientific community.¹⁸⁸ Equally, if the *Daubert* test had been adopted the ear print evidence would have failed to satisfy all the criteria of that test.¹⁸⁹ However, *Daubert* is not a check list, and techniques are often admissible even when they have failed one of the criteria.¹⁹⁰

New fields of scientific expertise were also questioned in 2004, in *R v. Luttrell and Others*,¹⁹¹ where a skilled lip-reader had given evidence for the prosecution as to what was said between Luttrell and a co-accused in footage which had been caught on CCTV.¹⁹² The appellants had been convicted of conspiracy to handle stolen goods and appealed against the decision to allow lip-reading evidence at the trials, stating that such evidence had not been shown to be reliable and a warning should have been given to the jury.¹⁹³ The CACD noted that such evidence, like facial mapping, was a type of “real evidence” which was capable of passing the ordinary tests of relevance and reliability,¹⁹⁴ and was therefore potentially admissible in evidence. Once ruled to be admissible by a judge, the “actual reliability of the evidence will be determined by the jury in the light of cross-examination of the witness

¹⁷⁶ Ormerod & Barsby, *supra* note 174, at 314.

¹⁷⁷ *R v. Robb*, [1991] 93 Cr App R 161.

¹⁷⁸ A phonetician is a specialist in phonetics, namely “the sounds used in speech, or the scientific study of these”, *Phonetics*, THE FREE DICTIONARY, <http://www.thefreedictionary.com/phonetics> (last visited Aug. 17, 2015).

¹⁷⁹ *R v. Clarke*, [1995] 2 Cr App R 425.

¹⁸⁰ THE LAW COMMISSION 2009, *supra* note 4, at 20-22.

¹⁸¹ *R v. Dallagher*, [2002] EWCA Crim 1903.

¹⁸² *Id.* at [9].

¹⁸³ *Id.* at [6].

¹⁸⁴ *Id.* at [29].

¹⁸⁵ *Id.* at [24].

¹⁸⁶ *Id.* at [29].

¹⁸⁷ Bob Woffinden, *Earprint Landed Innocent Man in Jail for Murder*, THE GUARDIAN, Jan. 23, 2004.

¹⁸⁸ D.C. Ormerod & Clare Barsby, *Case Comment – Evidence: prosecution relying on expert evidence relating to ear prints*, CRIM. L. REV. 821, 823 (2002).

¹⁸⁹ *Id.*

¹⁹⁰ See, e.g., Sarah L. Cooper, *The Collision of Law and Science: American Court Responses to Developments in Forensic Science*, 33 PACE L. REV. 234 (2013).

¹⁹¹ *R v. Luttrell and Others*, [2004] EWCA Crim 1344.

¹⁹² *Id.* at [10].

¹⁹³ *Id.* at [39]. Appellants further stated that the prosecution had not disclosed all material relevant to the lip-reader’s expertise and reliability, *id.* at [49].

¹⁹⁴ *Id.* at [37].

and any contradictory expert evidence adduced by the opposing party.”¹⁹⁵ It was further stated that such evidence did require a special warning from the judge as to its limitations and risks of error, but the specific terms of such a direction would depend on the facts of the particular case.¹⁹⁶ The Law Commission has stated that there is “little judicial guidance, and certainly no consistent guidance, on how sufficiency of reliability is to be determined for expert evidence at the admissibility stage.”¹⁹⁷

In relation to deaths of infants, the infamous case of Sally Clark is a useful illustration of the lax attitude to evidentiary reliability that the courts in E&W have shown in the last couple of decades.¹⁹⁸ Clark and her husband, both solicitors, lost two baby sons to Sudden Infant Death Syndrome (SIDS). Clark had been convicted on two counts of murder in 1999, and had her first appeal dismissed in 2000.¹⁹⁹ In her second appeal in 2003, *R v. Clark (No 2)*,²⁰⁰ the CACD quashed her convictions based on two main reasons. First, the pathologist who carried out the autopsy on the second infant had failed to disclose results of microbiological tests which indicated the possibility that the infant died of natural causes.²⁰¹ Secondly, the statistical evidence given by the then distinguished Professor of paediatrics Sir Roy Meadow was erroneous.²⁰² Professor Meadow was an expert witness for the prosecution, and he testified that in his opinion there was only a one in 73 million chance of having two cases of SIDS in the same family.²⁰³ This approach completely disregarded any genetic or environmental factors affecting the likelihood of several infant deaths in the same family.²⁰⁴

The media was quick to blame this miscarriage of justice on Professor Meadow, but this is an overly simplistic explanation of a much larger problem.²⁰⁵ The CACD stated that it was “unfortunate that the trial did not feature any consideration as to whether the statistical evidence should be admitted in evidence.”²⁰⁶ Professor Meadow testified beyond his expertise and he got his calculations wrong.²⁰⁷ In summary, not only was the statistical evidence presented highly unreliable, but this approach also grouped the deaths together as a package even though the jury had been asked to consider separate verdicts in the two deaths.²⁰⁸

Professor Meadow had testified in other cases of SIDS.²⁰⁹ Angela Cannings lost three of her four babies when they were less than 18 weeks old.²¹⁰ She was convicted on two counts of murder after a trial where Professor Meadow had testified for the prosecution. Although Professor Meadow did not present the same statistical figures as in *Clark*, reference had been made to the rarity of multiple deaths in one family.²¹¹ In the appeal, *R v. Cannings*,²¹² the CACD looked further into the scientific basis behind claims of what would be considered natural or unnatural cases of SIDS.²¹³ It was clear to the court that there was a lot about death in infancy, including natural causes, that was still unknown.²¹⁴ Experts could not agree on whether certain cases had a natural or unnatural cause of death, which indicated to the court that the scientific or medical basis on which to make such assertions was not strong enough to provide the sole evidence for prosecution.²¹⁵ As a result of the Cannings case, there was a review of nearly 300 cases where a parent had been convicted of homicide or infanticide of a baby under the age of two.²¹⁶

¹⁹⁵ THE LAW COMMISSION 2009, *supra* note 4, at 18.

¹⁹⁶ *R v. Luttrell and Others*, [2004] EWCA Crim 1344 at [44].

¹⁹⁷ THE LAW COMMISSION 2009, *supra* note 4, at 19.

¹⁹⁸ *R v. Clark (No.2)*, [2003] EWCA Crim 1020.

¹⁹⁹ *Id.* at [1].

²⁰⁰ *Id.*

²⁰¹ *Id.* at [171]. The failure to disclose the results of important tests highlighted issues which were later addressed by the field of pathology. However, these issues are beyond the scope of this article and will not be discussed in detail.

²⁰² *Id.* at [180].

²⁰³ *Id.* at [173].

²⁰⁴ Adam Wilson, *Expert Testimony in the Dock*, J. CRIM. L. 330, 343 (2005).

²⁰⁵ *Id.* at 330.

²⁰⁶ *R v. Clark (No.2)*, [2003] EWCA Crim 1020, [173].

²⁰⁷ *Id.* at [103], “simply squaring the figure was an illegitimate over simplification”.

²⁰⁸ *R v. Clark (No.2)*, [2003] EWCA Crim 1020 [173].

²⁰⁹ *R v. Cannings*, [2004] EWCA Crim 1.

²¹⁰ *Id.* at [1], [3].

²¹¹ *Id.* at [29], [42], [130].

²¹² *Id.*

²¹³ *Id.* at [142], [145], [149].

²¹⁴ *Id.* at [177].

²¹⁵ *Id.* at [178].

²¹⁶ C.P. Walker & Carole McCartney, *Case Comment – Evidence: Expert Witnesses Seriously Disagreeing as to whether Cause of Death of Infants Natural or Unnatural*, CRIM. L. REV. 126, 129 (2005).

Lorraine Harris was convicted of the manslaughter of her infant son in 2000, after it was determined that the baby had shown the triad of symptoms believed to establish Shaken Baby Syndrome (SBS), namely subdural haemorrhage, retinal haemorrhage, hypoxic-ischaemic encephalopathy.²¹⁷ On appeal in 2005, Harris' case was heard together with three other convictions where infants had died or been seriously injured by a caregiver.²¹⁸ These were Faulder, Cherry and Rock, convicted of inflicting grievous bodily harm, manslaughter and murder respectively.²¹⁹ The court found that new evidence undermined the notion that the mere presence of a triad of intra-cranial injuries would indicate a non-accidental head injury in a child.²²⁰ The court acknowledged the unreliable nature of the evidence believed to indicate SBS, and quashed Harris' conviction,²²¹ although the court also emphasised their view that developments in scientific thinking should not be excluded from court "simply because they remain at the stage of a hypothesis."²²² In *R v. Henderson and Others* in 2010, the CACD discussed in some detail how cases such as these, which rely mainly on expert evidence, should be dealt with in court.²²³

B. THE LAW COMMISSION'S PROPOSAL FOR REFORM

In its 2009 Consultation Paper,²²⁴ the Law Commission discussed the case of *Bonython*²²⁵ in some detail in relation to the admissibility of expert evidence. In *Bonython*, the Supreme Court of South Australia had confirmed that part of the admissibility test in that jurisdiction was "whether the subject matter of the opinion forms part of a body of knowledge or experience which is sufficiently organized or recognized to be accepted as a reliable body of knowledge or experience."²²⁶

The extent to which *Bonython* actually applies in E&W has been debated. In a 2010 speech for the Forensic Science Society and King's College, London, Lord Justice Leveson suggested that the evidentiary reliability part of *Bonython* did not at that time represent the current state of the law in E&W.²²⁷ However, both before and after this speech the CACD have made clear references to *Bonython* in at least two significant criminal appeals. In *R v. Reed and Reed*²²⁸ and *R v. Broughton*,²²⁹ two appeals where the reliability of Low Template DNA²³⁰ (DNA from minute samples) was questioned, the CACD seemed to accept that there was indeed a common law reliability test, at least for scientific evidence.²³¹

The Law Commission has suggested that part of the problem with evidentiary reliability is that the CACD has appeared to be reluctant to exclude new and developing areas of science from court²³². The reliability requirement in the common law admissibility test was considered insufficiently robust,²³³ reflecting what they termed a *laissez-faire* approach to the admissibility of expert evidence in E&W.²³⁴ It was also noted that juries tended to defer to an expert opinion, and that unreliable expert evidence was not effectively challenged in cross examination.²³⁵

The Law Commission made proposals for statutory reform in the Draft Criminal Evidence (Experts) Bill 2011.²³⁶ In that Bill, they advocated for an approach that did not focus upon the scientific status of the evidence proffered, but rather its reliability.²³⁷ The Law Commission attempted to reduce the likelihood of unreliable scientific evidence being admitted into court by codifying existing common law principles and adopting a number of

²¹⁷ *R v. Harris and Others*, [2005] EWCA Crim 1980, at [122].

²¹⁸ *Id.* at [1].

²¹⁹ *Id.* at [1], [2].

²²⁰ THE LAW COMMISSION 2009, *supra* note 4, at 13-14.

²²¹ *R v. Harris and Others*, [2005] EWCA Crim 1980 at [153].

²²² *Id.* at [270].

²²³ *R v. Henderson and Others*, [2010] EWCA Crim 1269.

²²⁴ THE LAW COMMISSION 2009, *supra* note 4, at 13-14.

²²⁵ *R v. Bonython*, (1984) 38 SASR 45.

²²⁶ *Id.*

²²⁷ THE LAW COMMISSION 2011, *supra* note 14, at 15.

²²⁸ *R v. Reed and Reed*, [2009] EWCA Crim 2698.

²²⁹ *R v. Broughton*, [2010] EWCA Crim 549.

²³⁰ "Low template DNA or low copy number DNA (LCN) refers to samples that contain less than the 250pg (>100pg) required to produce a complete profile using the standard 28-30 cycles. LCN was launched into casework in the UK in 1999." East Midlands Forensic Pathology Unit, *Low Template DNA*, UNI. LEICESTER, <http://www2.le.ac.uk/departments/emfpu/genetics/explained/low-template> (last visited Aug. 16, 2015).

²³¹ THE LAW COMMISSION 2011, *supra* note 14, at 16.

²³² *Id.* at 4.

²³³ *Id.* at 16.

²³⁴ *Id.* at 4.

²³⁵ *Id.* at 5.

²³⁶ Draft Criminal Evidence (Experts) Bill, 2011, *see id.* at 146-158.

²³⁷ *Id.* at Art. 4.

characteristics from the USSC's approach.²³⁸ However, from the National Research Council's report *Strengthening the Forensic Sciences in the US: A Path Forward* (the NRC Report),²³⁹ it appears that the US approach has often failed to prevent the admission of unreliable evidence. It is therefore unlikely that the Law Commission's proposals, which drew heavily on *Daubert*, would have prevented unreliable scientific evidence from being admitted into the courts.²⁴⁰

Edmond suggested that the Law Commission's proposals would not bring about the changes needed, and that the approach did little more than turning admissibility decisions and the reliability of expert opinions into questions of law.²⁴¹ However, some scholars have agreed that the Law Commission should be commended for tackling this issue,²⁴² with Ward arguing that the proposals provided some well needed clarity on the issue, but that judges could use their existing powers to achieve similar results.²⁴³ Considering critical studies such as the NRC Report (2009),²⁴⁴ Garrett (2011),²⁴⁵ and the Scottish fingerprint inquiry (2012),²⁴⁶ it is questionable whether judges are equipped to act as 'gate-keepers' to ensure only accurate and reliable evidence is entered into the courts.²⁴⁷

The government rejected the proposed Bill in November 2013.²⁴⁸ Reasons for the rejection included the costs that extra pre-trial hearings to determine the reliability of evidence would involve.²⁴⁹ The government suggested that changes could be made to existing legislation, such as the Criminal Procedure Rules, to accommodate some of the recommendations from the proposal.²⁵⁰ As a result, to this date, there is no statutory reliability test in place in E&W.

IV. CONTROVERSIES RELATING TO MEDICAL AND SCIENTIFIC EVIDENCE IN CASES OF ALLEGED SHAKEN BABY SYNDROME / ABUSIVE HEAD TRAUMA

In E&W, three categories of miscarriages of justice caused by expert evidence have been scrutinized by the courts and the Law Commission recently.²⁵¹ According to Phillips, these are cases where the expert (1) "deliberately misled the court,"²⁵² (2) testified beyond or outside their expertise,²⁵³ and (3), where the expert has relied "on flawed or faulty forensic or diagnostic techniques."²⁵⁴

²³⁸ Gary Edmond, *The Admissibility of Incriminating Expert Opinion Evidence in the US, England and Canada*, 23(8) JUD. OFFICERS' BULL. 67 (2011). See also *Daubert*; Donald E. Shelton, *Forensic Science Evidence and Judicial Bias in Criminal Cases*, 49(3) JUDGES' JOURNAL 18 (2010); THE LAW COMMISSION 2011, *supra* note 14.

²³⁹ NRC REPORT, *supra* note 4.

²⁴⁰ See, e.g., Jane Campbell Moriarty, *Will History Be Servitude?: The NAS Report on Forensic Science and the Role of the Judiciary*, 2 UTAH L. REV. 299 (2010); Christine Fung & Evan Berman, *Rising to the Challenge of the NAS Report Strengthening Forensic Science in the United States: A Path Forward: A Call for Demonstrated Competence Amongst Legal Practitioners*, 37(2) WM. MITCHELL L. REV. 683 (2010); Paul C. Giannelli, *Fallout From the NAS Forensic Science Report*, 25 CRIM. JUST. 53 (2010-2011).

²⁴¹ Gary Edmond, *Is Reliability Sufficient? The Law Commission and Expert Evidence in International and Interdisciplinary Perspective: Part 1*, 16(1) INT'L J. EVIDENCE & PROOF 30 (2012); Gary Edmond, *Advice for the Courts? Sufficiently Reliable Assistance with Forensic Science and Medicine: Part 2*, 16(3) INT'L J. EVIDENCE & PROOF 263 (2012). See also Edmond, *supra* note 238; Gary Edmond & Andrew Roberts, *Procedural Fairness, the Criminal Trial and Forensic Science and Medicine*, 33 SYDNEY L. REV. 359 (2011); Adam Wilson, *The Law Commission's Recommendation on Expert Opinion Evidence: Sufficient Reliability?*, 3 WEB JCLI (2012).

²⁴² Gary Edmond & Andrew Roberts, *The Law Commission's Report on Expert Evidence in Criminal Proceedings*, 11 CRIM. L. REV. 844 (2012).

²⁴³ Tony Ward, *Expert Evidence and the Law Commission: Implementation Without Legislation?*, 7 CRIM. L. REV. 561, 571(2013).

²⁴⁴ NRC REPORT, *supra* note 4.

²⁴⁵ BRANDON L. GARRETT, *CONVICTING THE INNOCENT: WHERE CRIMINAL PROSECUTIONS GO WRONG* (2011).

²⁴⁶ THE FINGERPRINT ENQUIRY, THE SCOTTISH FINGERPRINT ENQUIRY REPORT (2012) available at http://www.thefingerprintinquiryScotland.org.uk/inquiry/files/TheFingerprintInquiryReport_Low_res.pdf.

²⁴⁷ See, e.g., *Daubert*; Liz Heffernan & Mark Coen, *The Reliability of Expert Evidence: Reflections on the Law Commission's Proposals for Reform*, 73(6) J. CRIM. L. 488 (2009); Andrew Roberts, *Rejecting General Acceptance, Confounding the Gate-Keeper: The Law Commission and Expert Evidence*, 8 CRIM. L. REV. 551 (2009); Ken Shaw, *Expert Evidence Reliability; Time to Grasp the Nettle*, 75(5) J. CRIM. L. 368 (2011); NRC REPORT, *supra* note 4.

²⁴⁸ MINISTRY OF JUSTICE, *supra* note 16.

²⁴⁹ SKILLS FOR JUSTICE, *supra* note 17.

²⁵⁰ *Id.*

²⁵¹ THE LAW COMMISSION 2011, *supra* note 14; Edward Phillips, *Miscarriages of Justice and the Forensic Expert: The Impact of the Law Commission's Reforms*, 79 MED. LEG. J. 94 (2011).

²⁵² Phillips, *supra* note 251, at 94.

²⁵³ *Id.*

²⁵⁴ *Id.* at 95.

The CACD has acknowledged that SBS/AHT cases are largely relying on expert evidence of a complex nature.²⁵⁵ However, the adversarial system does not appear to be an objective ‘truth-finder’, and Roberts²⁵⁶ supports the notion that the “adversarial procedure is sometimes suboptimal for truth-finding.”²⁵⁷ This is also apparent when looking at what has been aptly described as “litigation-driven science”,²⁵⁸ where arguments from both sides of the SBS/AHT debate have been exacerbated.²⁵⁹ At the heart of this debate is whether a triad of symptoms, namely subdural hemorrhage, retinal hemorrhage and hypoxic-ischemic encephalopathy, is pathognomonic of SBS/AHT.²⁶⁰

The reliability of evidence relating to alleged SBS/AHT cases appears to be particularly problematic in the heavily polarized debate around SBS/AHT, especially in relation to the triad of symptoms thought to be pathognomonic of SBS/AHT.²⁶¹ In order to improve our understanding of the symptoms included in the triad, studies and experiments have been carried out in a variety of different disciplines, including anatomy, engineering, medicine and pathology.²⁶²

In 2003, Geddes *et al* suggested a new hypothesis around the triad of symptoms, which is often referred to as “Geddes Unified Hypothesis” or Geddes III.²⁶³ The unifying hypothesis is a proposition that the triad of symptoms associated with SBS can be caused by severe hypoxia (lack of oxygen in the tissues).²⁶⁴ This may lead to brain swelling.²⁶⁵ This, combined with raised intracranial pressure, could produce both subdural and retinal hemorrhages and can be seen in *natural* deaths as well as in alleged SBS cases.²⁶⁶ Accordingly it was asserted that any incidents of apnea (the cessation of breathing) set in motion a cascade of events leading to the triad of symptoms often associated with SBS.²⁶⁷ This questions the validity of the triad as a diagnostic tool and suggests that apnea may have many different causes, including trauma or abuse.

Squier and Mack researched structures of the cranium, including the dura, arachnoid barrier and the bridging veins, and how these developed in infants.²⁶⁸ Their findings challenged beliefs that bridging vein rupture was the cause of subdural hemorrhage in this particular age group, and suggested that rupturing of a rich plexus of intradural vessels may be the cause of subdural hemorrhage without trauma.²⁶⁹ A similar study noted decreased levels of cerebrospinal fluid in subdural hemorrhage without trauma, and acknowledged that the dura was incredibly complex and that a better understanding of it would provide important insights into subdural hemorrhages.²⁷⁰

²⁵⁵ Andrew Roberts, *Case Comment: Evidence: Expert Evidence in Cases Involving Sudden Death of Child*, 12 CRIM. L. REV. 945 (2010).

²⁵⁶ Paul Roberts, *Renegotiating Forensic Cultures: Between Law, Science and Criminal Justice*, 44 STUD. HIST. & PHIL. BIOLOGICAL & BIOMEDICAL SCI. 47 (2013).

²⁵⁷ *Id.* at 55.

²⁵⁸ See, e.g., Susan Haack, *What’s Wrong with Litigation-Driven Science? An Essay in Legal Epistemology*, 38 SETON HALL L. REV. 1053 (2008); Joëlle A. Moreno and Brian Holmgren, *The Supreme Court Screws Up the Science: There Is No Abusive Head Trauma/Shaken Baby Syndrome “Scientific” Controversy*, 5 UTAH L. REV. 1357 (2013).

²⁵⁹ *Id.*

²⁶⁰ See Findley *et al.*, *supra* note 20.

²⁶¹ See, e.g., Deborah Tuerkheimer, *Science-Dependent Prosecution and the Problem of Epistemic Contingency: A Study of Shaken Baby Syndrome*, 62(3) ALA. L. REV. 513 (2011).

²⁶² See, e.g., D.C. Batterbee *et al.*, *Computational Model of an Infant Brain Subjected to Periodic Motion Simplified Modelling and Bayesian Sensitivity Analysis*, 225 J. ENGINEERING MED. 1036 (2011); Jingmin Cheng, I.C. Howard & M. Rennison, *Study of an Infant Brain Subjected to Periodic Motion Via a Custom Experimental Apparatus Design and Finite Element Modelling*, 43 J. BIOMECHANICS 2887 (2010); John W. Finnie, Jim Manavis & Peter C. Blumbergs, *Diffuse Neuronal Perikaryal Amyloid Precursor Protein Immunoreactivity in an Ovine Model of Nonaccidental Head Injury (the Shaken Baby Syndrome)*, 17(2) J. CLINICAL NEUROSCIENCE 237 (2010); Steven A. Hans, Sebastian Y. Bawab & Michael L. Woodhouse, *A Finite Element Infant Eye Model to Investigate Retinal Forces in Shaken Baby Syndrome*, 247(4) GRAEFES’ ARCHIVE FOR CLINICAL & EXPERIMENTAL OPHTHALMOLOGY 561(2009).

²⁶³ J.F. Geddes *et al.*, *Dural Haemorrhage in Non-Traumatic Infant Deaths: Does It Explain the Bleeding in ‘Shaken Baby Syndrome’?*, 29 NEUROPATHOLOGY & APPLIED NEUROBIOLOGY 14 (2003).

²⁶⁴ *Id.* at 20.

²⁶⁵ *Id.*

²⁶⁶ *Id.* at 18, 20.

²⁶⁷ *Id.* at 20.

²⁶⁸ Waney Squier & Julie Mack, *The Neuropathology of Infants of Dual Haemorrhage*, 187 FORENSIC SCI. INT’L 6 (2009).

²⁶⁹ *Id.* at 12.

²⁷⁰ Julie Mack, Waney Squier & James T. Eastman, *Anatomy and Development of the Meninges: Implications for Subdural Collections and CSF Circulation*, 39(3) PEDIATRIC RADIOLOGY 200 (2009).

A study of ten teenage athletes who had suffered acute subdural hemorrhage drew multiple parallels between these teenage athletes and infants diagnosed with non-accidental trauma.²⁷¹ The study suggested that a “second impact syndrome”,²⁷² which occurs when a second injury is sustained before the first injury has healed, may be relevant to the SBS debate.²⁷³ In addition, the higher representation of males in cases of SBS/AHT was considered in a study which provided several biological explanations for such an overrepresentation,²⁷⁴ which further undermined the case for the triad as pathognomonic of SBS as these causes mimicked child abuse.²⁷⁵

Retinal hemorrhages in infants have also been studied. In 2009, Togioka *et al* analyzed 66 academic articles that covered the subject, and concluded that although the presence of retinal hemorrhages did not guarantee SBS, it was rare in cases of non-accidental head injury whereas it appeared to be common in abused children.²⁷⁶ However, studies have since explored a number of alternative causes for retinal hemorrhages in infants.²⁷⁷ For example, it was suspected that a five-week old child had sustained a non-accidental injury after experiencing a rapid onset of symptoms including drowsiness and hypotonia, unilateral retinal hemorrhages and an intracranial hemorrhage in the posterior fossa.²⁷⁸ An arteriovenous malformation was discovered at a repeat neuroimaging scan weeks later, which would have contributed to the retinal hemorrhages and this removed the suspicion of a non-accidental injury.²⁷⁹ The autopsy findings from four children aged three or younger found that retinal hemorrhages, which had been caused by fatal consequences of infection complications, mimicked some patterns in retinal hemorrhages associated with non-accidental trauma.²⁸⁰

In addition, a study which looked at two babies who had experienced fatal head injuries *in utero* following motor vehicle accidents, noted that both had extensive retinal hemorrhages and optic nerve sheath hemorrhages with peripapillary intrascleral hemorrhages.²⁸¹ The authors commented that, on the rare occasions that they were discussed in the relevant literature, peripapillary intrascleral hemorrhages were considered pathognomonic for abusive head trauma.²⁸² As the babies had been *in utero* a shaking motion was highly unlikely. Therefore, peripapillary intrascleral hemorrhages should not necessarily be considered conclusively the agnostic of abusive head trauma.²⁸³

Experiments to improve our understanding of the symptoms of SBS/AHT have been carried out. These have had varying results, but no experiment has unequivocally confirmed that the triad of symptoms is pathognomonic to SBS/AHT. For example, the shaking of a computational model of an infant eye suggested that shaking alone was enough to cause retinal hemorrhaging.²⁸⁴ The shaking of an automotive dummy showed that biomechanical investigations of SBS provided more accurate results “if the skull with paediatric features and the brain-skull interface are correctly represented.”²⁸⁵ The vigorous shaking of anesthetized lambs found only minimal axonal injury, subdural hemorrhages and retinal hemorrhages, although there was widespread neuronal perikaryal

²⁷¹ Robert C. Cantu & Alisa D. Gean, *Second-Impact Syndrome and a Small Sub Dual Haematoma: an Uncommon Catastrophic Result of Repetitive Head Injury with a Characteristic Imaging Appearance*, 27(9) J. NEUROTRAUMA 1557 (2010).

²⁷² Second-impact syndrome (SIS) is often seen in athletes. It involves a person suffering post-concussive symptoms following a head injury, and if sustaining a second head injury within a short time span this can lead to the brain swelling rapidly, and catastrophically. For a thorough discussion see Tareg Bey & Brian Ostick, *Second Impact Syndrome*, 10(1) W. J. EMERGENCY MED. 6 (2009).

²⁷³ Cantu & Gean, *supra* note 271.

²⁷⁴ Rubin Miller & Marvin Miller, *Overrepresentation of Males in Traumatic Brain Injury of Infancy and in Infants with Macrocephaly: Further Evidence That Questions the Existence of Shaken Baby Syndrome*, 31(2) 165 AM. J. FORENSIC MED. & PATHOLOGY 165 (2010).

²⁷⁵ *Id.* at 165.

²⁷⁶ Brandon M. Togioka *et al.*, *Retinal Hemorrhages and Shaking Baby Syndrome: An Evidence-Based Review*, 37(1) J. EMERGENCY MED. 98 (2009).

²⁷⁷ Findley *et al.*, *supra* note 20, at 339-240; Aravind R. Reddy, Michael Clarke & Vernon Long, *Unilateral Retinal Hemorrhages with Subarachnoid Hemorrhage in a Five – Week – Old Infant: Is This Nonaccidental Injury?* 20(4) EUR. J. OPHTHALMOLOGY 799 (2010); Marcus C. Salvatori & Patrick E. Lantz, *Retinal Haemorrhages Associated with Fatal Paediatric Infections*, 55(2) MED. SCI. LAW 121 (2015).

²⁷⁸ Reddy, Clarke & Long, *supra* note 277.

²⁷⁹ *Id.* at 799.

²⁸⁰ Salvatori & Lantz, *supra* note 277.

²⁸¹ Candace H. Schoppe & Patrick E. Lantz, *Are Peripapillary Intrascleral Hemorrhages Pathognomonic for Abusive Head Trauma?*, 58(1) J. FORENSIC SCI. 228 (2013).

²⁸² *Id.* at 228.

²⁸³ *Id.* at 231.

²⁸⁴ Hans, Bawab & Woodhouse, *supra* note 262.

²⁸⁵ Cheng, Howard & Rennison, *supra* note 262, at 2887.

amyloid precursor protein expression.²⁸⁶ Finally, a computational model of an infant brain was subjected to periodic motion and the findings “provided an enhanced understanding of the effects of parameter uncertainty on the dynamics of SBS.”²⁸⁷

As early as 2006, it was widely recognized, that there were many “mimics” of SBS/AHT.²⁸⁸ In a 2011 article, Squier discussed alternative and common causes for the triad of symptoms, including accidental falls, cortical vein and sinus thrombosis, inflicted injury, vitamin D deficiency, second impact syndrome, aneurysm rupture, rare genetic conditions, and resuscitation related injuries.²⁸⁹

In contrast, also in 2011, Narang argued that evidence-based medical literature supported the scientific soundness of AHT and, therefore, satisfied all the criteria under *Daubert*.²⁹⁰ Narang further disregarded Geddes’ Unified Hypothesis and Squier and Mack’s dural immature vascular plexus theory, pointing out that studies existed that showed that retinal hemorrhages and subdural hemorrhages were statistically significantly correlated with AHT.²⁹¹

Findley *et al* responded to the criticism and identified methodological problems with Narang’s article, including statistical misinterpretations and observer bias, and went on to clearly state the main scientific points behind the “new paradigm.”²⁹² Furthermore, as Findley *et al* point out, “Changing the name of the syndrome from SBS to AHT does not, however, resolve the disagreement.”²⁹³

What emerges from the above discussions is that this is a field in crisis. Medical, legal, academic and other scholars have voiced concern about the use of the SBS/AHT triad of symptoms as a tool for diagnosis and prosecution, as significant medical and scientific evidence discredits its very existence. Each of the symptoms contained in the triad have several natural and accidental causes in addition to abuse, so it is therefore difficult to see how the triad could be considered reliable in a medical or scientific sense. Maintaining that the triad is reliable in a legal sense is simply absurd.

Furthermore, it needs to be questioned how objective the science around the triad and identification of SBS/AHT really is. Although the identification of symptoms might be objective (i.e. symptoms are present and correctly identified), concluding that these symptoms are indeed evidence consistent with non-accidental injuries appears to be a completely subjective exercise.²⁹⁴

In the US case of *Del Prete v. Thompson* in 2014, the court was explicitly suspicious of the SBS/AHT diagnosis.²⁹⁵ In a footnote to the opinion, the court wrote that the testimony and evidence presented “arguably suggests that a claim of shaken baby syndrome is more an article of faith than a proposition of science.”²⁹⁶ A year later, in early 2015, an open letter signed by an international group of 34 doctors, medical professionals, and international experts outlined the problems with how cases of SBS/AHT were being prosecuted by the courts in the US and E&W.²⁹⁷ In the letter, the authors noted that “SBS has never been proved as anything more than an hypothesis”,²⁹⁸ and urged both criminal and civil courts to listen to both sides of the disagreements around the diagnosis.²⁹⁹

²⁸⁶ Finnie, Manavis & Blumbergs, *supra* note 262.

²⁸⁷ Batterbee et al., *supra* note 262, at 1048.

²⁸⁸ Findley et al., *supra* note 20, at 239-240.

²⁸⁹ Waney Squier, *The “Shaken Baby” Syndrome: Pathology and Mechanisms*, 122(5) ACTA NEUROPATHOLOGICA 519 (2011).

²⁹⁰ Sandeep Narang, *A Daubert Analysis of Abusive Head Trauma/Shaken Baby Syndrome*, 11 HOUS. J. HEALTH L. & POL’Y 505, 576-583, 592 (2011).

²⁹¹ *Id.* at 595.

²⁹² Findley et al., *supra* note 20, at 297-298.

²⁹³ *Id.* at 215.

²⁹⁴ Science is regularly presented, and understood, as being objective, even where the results presented are, in fact, subjective. Courts frequently admit subjective science, such as fingerprints, as evidence. *See, e.g.*, Kola Abimbola, *Reason and Proof in Forensic Evidence*, 11 J. FORENSIC RES. 1 (2013); Simon A. Cole & Andrew Roberts, *Certainty, individualisation and the Subjective Nature of Fingerprint Evidence*, 11 CRIM. L. REV. 824 (2012).

²⁹⁵ *Del Prete v. Thompson*, 2014, WL 296094 (N.D. Ill. Jan. 27, 2014).

²⁹⁶ *Id.* at 96.

²⁹⁷ Wrennall et al., *supra* note 21.

²⁹⁸ *Id.* at 3.

²⁹⁹ *Id.* at 4.

Despite the controversies outlined above, in E&W the Crown Prosecution Service (CPS) still rely on guidelines from March 2011 on how to prosecute cases of “non accidental head injury” (NAHI).³⁰⁰ Changing the term from SBS to non accidental head injury does not change the fact that it is still the triad of symptoms that will be relied upon for a prosecution. The CPS states that “cases will usually be diagnosed by a Triad of internal head injuries”³⁰¹ and “will *usually* require the Triad of injuries plus supporting evidence.”³⁰² It also states that Geddes’ Unified Hypothesis has not been endorsed by the CACD.³⁰³ Although a positive step has been taken by acknowledging that the triad alone should *usually* not be the sole basis for a prosecution, there are still dangers associated with the supporting evidence, as this also needs to be reliable, relevant and objective. As discussed by Henneberg and Loveday in this special issue, the mere finding of the triad of symptoms may influence the police investigation, leading to tunnel vision and case construction.³⁰⁴ Case construction occurs when the police and prosecution only focus on evidence which will support their hypothesis that a particular suspect is guilty, and any evidence to the contrary is excluded or its importance is minimized.³⁰⁵ This may result in the prosecution having insufficiently reliable evidence against a suspect admitted in court in order to bolster its case.³⁰⁶

V. CONCLUSION

This article has examined the admissibility of scientific evidence in criminal trials in the US and in E&W. The US approach was found to be more robust than that in E&W, although in relation to controversies around SBS/AHT, weaknesses have been noted in both. The NRC Report suggested that sciences should be improved before they could be considered reliable in court.³⁰⁷ In E&W, the focus has been on legal reliability rather than scientific reliability, which makes the common law admissibility framework relatively weak in comparison to the approach in the US.³⁰⁸

Studies referred to in this article show that medical and scientific evidence believed to be pathognomonic of SBS/AHT need to be considered as highly unreliable.³⁰⁹ Edmond and San Roque state that adversarial legal systems assume that science and medical evidence is “epistemologically robust”³¹⁰ although when scrutinized, a lot of such evidence “is either unreliable or of unknown reliability.”³¹¹ Litigation-driven science may be part of the problem, at least in the US, as it keeps the SBS/AHT debate extremely polarised.³¹²

The Law Commission identified a number of problems relating to the reliability of scientific evidence in criminal courts.³¹³ A contradiction can be seen as although courts have been shown to have a lax attitude towards evidentiary reliability, for example by allowing weak science such as ear prints into court, they appear to be holding on to outdated science for far too long. The question of admissibility then becomes a double-edged sword, and this is a problem in both the US and in E&W. To avoid this, courts need to recognize and consider significant developments relating to SBS/AHT, and use this to improve the quality of medical and scientific evidence before it is admitted into court. As weaknesses in the admissibility frameworks have been identified, this would be beneficial in both the US and in E&W.

³⁰⁰ CPS guidelines are available online. See *Non-Accidental Head Injury Cases (NAHI, Formerly Referred to As Shaken Baby Syndrome [SBS]) – Prosecution Approach*, CPS.GOV.UK, (Mar. 24, 2011) http://www.cps.gov.uk/legal/l_to_o/non_accidental_head_injury_cases/.

³⁰¹ *Id.*

³⁰² *Id.*, emphasis added.

³⁰³ *Id.*

³⁰⁴ See article by Henneberg and Loveday in this Special Issue.

³⁰⁵ *Id.* at ???

³⁰⁶ *Id.* at ???

³⁰⁷ NRC REPORT, *supra* note 4.

³⁰⁸ Rhonda M. Wheate & Allan Jamieson, *A Tale of Two Approaches – The NAS Report and the Law Commission Consultation Paper on Forensic Science*, 7(2) INT’L COMMENTARY ON EVIDENCE, Art. 3 (2009).

³⁰⁹ See also, e.g., Findley et al., *supra* note 20.

³¹⁰ Gary Edmond & Mehera San Roque, *The Cool Crucible: Forensic Science and the Frailty of the Criminal Trial*, 24(1) CURRENT ISSUES CRIM. JUST. 51, 51 (2012).

³¹¹ *Id.* at 51.

³¹² See, e.g., Haack, *supra* note 258; Moreno & Holmgren, *supra* note 258.

³¹³ THE LAW COMMISSION 2009, *supra* note 4; THE LAW COMMISSION 2011, *supra* note 14.